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EXAMINER

GARRITY, DIANA C

ART UNIT

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2814

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/594,619

Applicant(s)

TANAKA, AKIMASA

Examiner

DIANA C. GARRITY

Art Unit

2814

Period for Reply -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 25 September 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1 and 3-20 is/are pending in the application.
- 4a) Of the above claim(s) 1-20 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1 and 3-10 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-8508)
Paper No(s)/Mail Date 8/5/08
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Status of Claims

1. **Amendment filed September 25, 2008 is acknowledged.**
 - Claims 2 have been cancelled.
 - Claims 1 and 3-20 are pending.
 - Claims 11-20 have been withdrawn from consideration.
 - Claims 1 and 6 have been amended.
 - Claims 1 and 3-10 are examined below.
 - Claims 1 and 3-10 are rejected.

Response to Arguments

2. **Applicant's arguments with respect to claims 1-10 have been considered but are moot in view of the new ground(s) of rejection.**

Information Disclosure Statement

3. **The information disclosure statement filed August 5, 2008 fails to comply with 37 CFR 1.98(a)(1), which requires the following:** (1) a list of all patents, publications, applications, or other information submitted for consideration by the Office; (2) U.S. patents and U.S. patent application publications listed in a section separately from citations of other documents; (3) the application number of the application in which the information disclosure statement is being submitted on each page of the list; (4) a column that provides a blank space

next to each document to be considered, for the examiner's initials; and (5) a heading that clearly indicates that the list is an information disclosure statement. Specifically, the IDS list does not include the Chinese Notification of First Office Action. The information disclosure statement has been placed in the application file, but the information referred to above has not been considered.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claims 1-10 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Nowhere in the written description was there described that the first electrode has projection portions in a first main face side. The claim refers to exclusive projection and depression portions, but there is no suggestion as to how the two are distinguishable.

Claim Rejections - 35 USC § 102

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

5. Claims 1-3, 8 and 9 are rejected under 35 U.S.C. 102(b) as being anticipated by Gaalema (US 4,507,674).

Regarding claim 1, Gaalema (Figure 1) teaches a photodetector device comprising:

- a multilayer structure (10) including a plurality of compound semiconductor layers (18 and 20) laminated and having first and second main faces opposing each other;
 - a photodetecting region (19) formed near the first main face within the multilayer structure;
 - a first electrode (16) arranged on the first main face of the multilayer structure and electrically connected to the photodetecting region (column 4, ln 60 - column 5, ln 6);
 - a second electrode (28) arranged on the second main face of the multilayer structure and electrically connected to the first electrode (14, 16);
 - a third electrode (26) arranged on the second main face of the multilayer structure and electrically connected to a part near the second main face in the multilayer structure; and
 - a light transmitting layer (12), optically transparent (column 4, ln 56-59) to incident light and arranged on the first main face of the multilayer structure, covering the photodetecting region and first electrode,
- wherein the light-transmitting layer includes a film made of silicon oxide and a glass substrate (column 10, ln 65 - column 11, ln 8; silicon oxide is glass),

wherein the glass substrate is secured to the multilayer structure through the film made of silicon oxide (the glass itself is attached to itself, which is attached to the multilayer structure),
wherein the first electrode has [projection and] depression portions in a first main face side (30); and
wherein the film made of silicon oxide covers the first electrode (Figure 1) and makes the first main face of the multilayer structure flattened (Figure 1: the ultimate face of the multilayer surface, including the silicon oxide, is flat).

Regarding claim 3, Gaalema teaches the light transmitting layer includes a film made of silicon oxide or a resin (column 10, ln 65 - column 11, ln 8; silicon oxide is glass).

Regarding claim 8, Gaalema teaches a light-reflecting film (26; column 8, ln 45-51), provided on the second main face, covering the photodetecting region.

Regarding claim 9, Gaalema teaches a plurality of photodetecting regions arranged in a row (column 3, ln 21-25).

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

6. Claims 4-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gaalema ('674) as applied to claim 1 above, and further in view of Yutaka et al. (JP 3-104287) of record.

Regarding claim 4, Gaalema teaches the photodevice of claim 1, but fails to teach the plurality of compound semiconductor layers include a high-concentration carrier layer of a first conductive type, a light-absorbing layer of the first conductive type, and a cap layer of the first conductive type; and wherein the photodetecting region is a region of a second conductive type including at least a part of the cap layer.

However, Yutaka et al. teaches a photodetector device which comprises a plurality of compound semiconductor layers including a high-concentration carrier layer of first conductivity type (8), a light absorbing layer of first conductivity type (7), and a cap layer of first conductivity type (1 and 5); and wherein the photodetecting region (2) is a region of a second conductive type including at least part of the cap layer.

Therefore, it would have been obvious to construct the multilayer semiconductor region of Gaalema according to the construction set forth by Yutaka et al. for the purpose of accurately controlling the width of each layer by use of an epitaxial growth method (Abstract).

Regarding claim 5, Gaalema in view of Yutaka et al. teaches the multilayer structure further comprises a depression (Gaalema: area inside 28) formed about the photodetecting region, and a wiring electrode (28) arranged within the depression; wherein the first electrode (16) is connected to the second electrode (28: top) through the wiring electrode; and

wherein the third electrode (26) is electrically connected to a part positioned near the photodetecting region in the high-concentration carrier layer (22 connected to 20, which in this case corresponds to Yutaka et al. high-concentration layer 8 in order of construction).

Regarding claim 6, Gaalema teaches a through lead (28) penetrating through the multilayer structure;

wherein the first electrode (16 is electrically connected to the second electrode (28) through the lead (28); and

wherein the third electrode (26) is electrically connected to the high-concentration carrier layer (22 connected to 20, which in this case corresponds to Yutaka et al. high-concentration layer 8 in order of construction).

7. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gaalema ('674) as applied to claim 1 above, and further in view of Fujii et al. (US 6,933,489).

Regarding claim 7, Gaalema teaches the second and third electrodes include respective pad electrodes (26 and 28: flat surfaces), and that second and third electrodes are attached to further circuitry (70 and 32).

Thus, Gaalema is shown to teach all the limitations of claim 7 with the exception of bump electrodes arranged on the pad electrodes.

However, Fujii et al. teaches an analogous backlit photodetector device in which bump electrodes (B) are attached to pad electrodes (OM) for the purpose of electrically and

mechanically attaching the photodetecting device to a semiconductor chip (C; column 2, ln 51-67).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to attach bump electrodes to the electrodes of Gaalema in order to reduce packaging area, and connect multiple photodetectors to a single circuitboard without much loss of real estate.

8. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gaalema ('674) as applied to claim 1 above, and further in view of Nunogaki et al. (US 5,602,384).

Regarding claim 10, Gaalema teaches the light transmitting layer (12).

Thus, Gaalema is shown to teach all the limitations of claim 10 with the exception of a lens part converging the incident light.

However, Nunogaki teaches an analogous light detector which uses a glass lens (130) to direct light into a photodetecting region (Column 25, ln 54-63).

Therefore, it would have been obvious to one of ordinary skill in the art to use a glass lens to focus the light in order to maximize radiation absorption efficiency, and to increase sensor output for light even at oblique angles (Nunogaki et al. column 25, ln 64 – column 26, ln 9).

Conclusion

9. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, THIS ACTION IS MADE FINAL. See MPEP § 706.07(a).

Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to DIANA C. GARRITY whose telephone number is (571) 270-5026. The examiner can normally be reached on Monday-Friday 7:00 AM - 3:30 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Anh Mai can be reached on (571) 272-1710. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Diana C Garrity/
Examiner, Art Unit 2814

/Anh D. Mai/
Primary Examiner, Art Unit 2814